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Memorandum

To	Bradley Nave, Chemours CRG Project Director	Page	1
Subject	2015 Pore Water Sampling Work Plan Chemours Belle Plant Belle, West Virginia		
From	Mark Houlday, AECOM Project Manager	Chemours #:509421 AECOM:60393975 (18986659)	
Date	September 22, 2015		

Introduction

AECOM has prepared this work plan on behalf of The Chemours Company (Chemours) to investigate sediment pore water in the Kanawha River adjacent to the Chemours Belle Plant. The Belle Plant is located in Kanawha County, West Virginia, eight miles southeast of Charleston, along Route 60. The Belle Plant is divided into two areas: the Plant Area and the Mountain Area, based on topography and land use. The Plant Area covers 105 acres located on the north bank of the Kanawha River.

The objective of the proposed investigation is to provide additional data for the evaluation of groundwater-to-surface water migration pathways at the Plant Area in the vicinity of two identified source areas: the former Sodium Styrene Sulfonate (SSS) Process Area and the Southwest Seep (SWS) Area (see Figure 1). The findings of the investigation, along with other lines of evidence, will be used to determine whether there is an unacceptable release to the Kanawha River benthic environment.

Background

Chemours operates two dual-phase extraction (DPE) systems at the Belle Plant. The systems were installed as interim remedial measures (IRMs) to reduce contaminant mass in the two source areas, the SWS Area, which is located within the former Benzol Process Area, and the former SSS Process Area.

Both DPE systems operated until May 2015 when the systems were shut down due to safety and maintenance concerns. After conducting maintenance activities, the DPE system located at the SWS Area was restarted. Several attempts to restart the DPE system at the former SSS Process Area have been unsuccessful. Troubleshooting activities to restart this system are ongoing.

At the time of the shutdown, a comprehensive evaluation of the system effectiveness was conducted. It was determined that the systems had reached the point of diminishing returns on mass removal. Only residual contaminant mass from groundwater and the shallow soil remains within these two areas of the plant.

In an e-mail to Chemours dated August 7, 2015, the U.S. Environmental Protection Agency (EPA) Region 3 expressed concerns that the groundwater concentrations in several wells were elevated with respect to ecological benchmarks and hence requested that pore water samples be collected in the Kanawha River adjacent to the shallow overburden wells MW-24-SO, MW-25-SO, MW-31-SO, MW-73-SO, and RW-5 in the SWS Area and former SSS Process Area (see Figure 1).

Scope of Work

This plan provides a framework to conduct a pore water investigation of the Kanawha River sediments. The sampling design and placement of proposed pore water sampling locations were developed based on recommendations made by EPA Region 3 in their August 7, 2015 email, the findings of the groundwater evaluations in the *2015 Proposed DPE System Shutdown Memorandum* (AECOM, 2015), and the *Kanawha River Water Sampling Investigation* [DuPont Corporate Remediation Group (CRG), 2003]. The following sections provide specific details of the proposed sample collection and analysis plan.

Study Design

Nine locations are proposed to be sampled along the Kanawha River bank adjacent to the site; two pore water samples will be collected from the vertical profile of the submerged riverbank at each proposed sampling location (as described below). The nine locations are proposed to characterize the pore water in the river, including four sampling locations each adjacent to the SWS Area and former SSS Process Area and one sampling location in the Upstream (Reference) Area (see Figure 1 and Table 1). Several of the proposed pore water sampling locations in the river principally target the potential discharge of groundwater associated with the on-site groundwater wells where elevated constituent concentrations are observed. These proposed sampling locations are adjacent to the groundwater wells MW-24-SO, MW-25-SO, MW-31-SO, MW-73-SO, and RW-5. Remaining sampling locations are proposed based on the 2003 near-shore surface water sampling locations used to evaluate the groundwater-to-surface water migration pathway (DuPont CRG, 2003). The reference sampling location is also proposed in the Upstream (Reference) Area to represent background conditions in the subsequent data evaluations.

As stated above, and shown in Figures 1 and 2, two pore water samples will be collected from each of the nine locations (for a total of 18 samples). One sample (near bank) will be collected from the submerged bank just below the surface-water level. A second sample (far bank) will be collected further out in the riverbed, which is likely to represent the benthic habitats in the broader river channel. The far bank pore water sample will be collected at approximately eight feet or shallower surface water depths, due to the depth limitation of sampling device and procedures. For both the near bank and far bank samples, the pore water will be collected from the top 2 to 3 inches of sediment (i.e., within the 6-inch bioactive zone in sediments).

The steep riverbank in the vicinity of the former SSS Process Area and SWS Area has been locally stabilized by the placement of riprap (see Figure 1). In addition, the bottom of the shallow overburden unit along the Kanawha River bank in the vicinity of the former SSS Process Area and the SWS Area is estimated to be within a few feet (above and below) the normal pool elevation of the river (590 feet above mean sea level), as shown schematically in Figure 2. Prior to sample collection, a field reconnaissance will be conducted to evaluate the bank conditions, substrate conditions, and access to the river sediments near the river water surface at the nine proposed locations. Proposed locations may be shifted based on the field reconnaissance findings.

Sample Collection Methods

Pore water samples will be collected using a PushPoint sampler (EPA, 2001; EPA, 2013) via a motorized boat. The motorized boat, equipped with a sub-meter accuracy global positioning system (GPS) unit, will be utilized to navigate to each sampling location. While minimizing disturbance to the riverbed, the boat will be positioned at each sampling location using two anchors for increased stability. [Additional information on the safe use of the boats will be provided in the Program Health and Safety Plan (in development)].

Once the boat has stabilized at the sampling location, the PushPoint will be inserted into the sediments until the screened portion of the sampler is two to three inches below the sediment-surface water interface; pore water will be slowly extracted from the sediments using a syringe. A detailed Sampling and Analysis Plan (SAP) is included for the collection of pore water via a PushPoint sampler from a motorized boat is provided in Appendix A.

To ensure the collection of true pore water at each sampling location, *in situ* water quality parameters will be compared for the unfiltered pore water and the overlying ambient surface water. A Myron 6P meter will be used to measure water quality parameters, including temperature, specific conductivity (SC), oxidation-reduction potential (ORP), and pH. Similar water quality parameters observed in the pore water and overlying surface water indicate that the pore water being collected is likely influenced by the overlying surface water. In that case, additional attempts will be made at an immediately adjacent location, as much as practicable, to collect an appropriate pore water sample with water quality parameters sufficiently different from the overlying surface water. Professional judgment will be used to decide whether the pore water being sampled is appropriately representative of conditions at the groundwater-surface water interface.

Site conditions (e.g., water depth, water velocity, substrate type, etc.) and potential interaction between pore water and surface water (see above) may prohibit the successful collection of a pore water sample at a given location. Where practical, additional attempts will be made to sample pore water as close as possible (preferable within 5 feet) of the original proposed pore water sampling location.

Analytical Scope

Five site-related constituents [benzene, toluene, ethylbenzene, xylenes (BTEX) and naphthalene] will be targeted for analysis (see Table 1). Target constituents were selected based on the frequency of detection and screening of groundwater concentrations relative to the corresponding pore water ecological screening values (ESVs) for the protection of benthic invertebrates (see Table 2).

The dataset used in selecting the target constituents included the same dataset presented in the *2015 Proposed DPE System Shutdown Memorandum* (AECOM, 2015). The dataset included the following currently sampled downgradient monitoring wells or recovery wells screened in the shallow overburden aquifer (see Figure 1):

- In the SWS Area: MW-24-SO, MW-25-SO, MW-73-SO, and MW-75-SO.
- In the former SSS Process Area: monitoring wells MW-76-SO, MW-77-SO, MW-31-SO, and MW-89; and, recovery wells RW-3, RW-4, and RW-5.

Groundwater data from the four most recent events (January 2014, April 2014, August 2014, and December 2014) in each area were used for the groundwater evaluation.

The constituents of potential concern (COPCs) in the both areas consist mainly of BTEX and naphthalene. Methylene chloride and 1,2-dibromoethane (EDB) were also historically detected in the former SSS Process Area and were included in a broader list of COPCs in the previous groundwater evaluation (AECOM, 2015).

To select the target constituents for the proposed evaluation, the seven COPCs from the aforementioned evaluation were screened against the pore water ESVs (see Table 2). EDB was not detected in target wells in both the SWS Area and former SSS Process Area. Methylene chloride was detected in 1 of 32 samples and only in the former SSS Process Area. Hence, these constituents (EDB and methylene chloride) were not considered further for the proposed investigation. The five remaining target constituents (BTEX and naphthalene) were all detected at greater frequencies in both areas and their maximum concentrations exceeded the pore water ESVs (see Table 2).

Therefore, these five constituents are proposed for analysis in the pore water samples using the EPA SW846 Method 8260B. Sample analysis will be conducted by Eurofins Lancaster Laboratories located in Lancaster, Pennsylvania.

Data Evaluation

Initially, maximum concentrations of the target constituents in pore water samples will be screened against the conservative pore water ESVs for the protection of benthic receptors [e.g., from EPA (2003, 2006, 2008), see Table 2]. If there are no exceedances, potential risks to benthic receptors are not expected and no further ecological evaluation is necessary. If there are exceedances, further evaluations will be conducted, that may include refinements of ecological benchmarks and/or exposure point concentrations, and comparisons to reference (upstream) data that will also be collected as a part of this investigation.

Supporting Plans

Sampling and Analysis Plan

A SAP was developed for this proposed investigation and is in Appendix A. The SAP presents the field procedures, functional activities, and quality assurance/quality control (QA/QC) measures associated with the proposed investigation. The SAP is intended to meet requirements for conducting the work associated with the proposed investigation in accordance with QA/QC field procedural protocols and laboratory analysis for environmental measurement data.

Health and Safety Plan

Prior to commencement of field activities associated with this proposed investigation, an updated project-specific Health and Safety Plan (HASP) addendum will be prepared. The purpose of the addendum is to assign responsibilities, establish personnel protection standards, specify safe operating procedures, and provide for contingencies that may arise during any of the field activities that take place as part of the investigation.

There are inherent health and safety concerns associated with the collection of pore water samples from the Kanawha River. Accessing the proposed sampling locations will require the use of a boat and field personnel will be deploying and retrieving sampling devices in areas with heavy barge traffic. It is Chemours' intent to collect all proposed Kanawha River pore water samples, however the health and safety of sampling personnel is the highest priority. Should field conditions prevent safe execution of some or all of the project scope, sampling efforts will be discontinued and field methodologies will be reevaluated.

Project Schedule and Reporting

Following EPA approval of this work plan, field activities will begin. It is anticipated that AECOM will conduct the field reconnaissance one to two weeks after receiving plan approval. After the reconnaissance is completed and site conditions are understood, the pore water sampling activities will be performed. The expected duration of the project (field reconnaissance, pore water sampling, laboratory analysis, and reporting) is estimated to take three months to complete.

References

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Tables

Table 1
Summary of Analytical Sampling
2015 Pore Water Work Plan
Chemours Belle Plant
Belle, West Virginia

Sampling Area	Sampling Media	Collection Method	Sample Description	No. of Sample Locations	Water Quality Parameters/Analytes
SWS Area	Pore Water	PushPoint	Near Bank	4	Water quality (temperature, specific conductivity, oxidation reduction potential, and pH) and benzene, toluene, ethylbenzene, and xylenes (BTEX) and naphthalene
			Far Bank	4	
Former SSS Area	Pore Water	PushPoint	Near Bank	4	
			Far Bank	4	
Upstream Area	Pore Water	PushPoint	Near Bank	1	
			Far Bank	1	

Notes:

Former SSS Area - Former Sodium Styrene Sulfonate Area

SWS Area - Southwest Seep Area

Table 2
Selection of Target List of Constituents
2015 Pore Water Work Plan
Chemours Belle Plant
Belle, West Virginia

Area	Constituents[1]	No. of Samples	Detects	Groundwater Concentrations (ug/L)			ESV (ug/L)	Reference	$N_{Exceedance}$ [4]
				Min[2]	Max[2]	Mean[3]			
Former SSS Area	1,2-Dibromoethane (EDB)	32	0	*0.5*	*100*	4.5	--	--	--
	Benzene	32	25	*0.5*	190000	25324	130	USEPA (2008)	15
	Ethylbenzene	32	23	*0.5*	3500	335	7.8	USEPA (2008)	15
	Methylene Chloride	32	1	*2*	400	22.6	98.1	USEPA (2006)	1
	Naphthalene	32	24	*0.1*	390	67.2	193	USEPA (2003)	4
	Toluene	32	23	*0.5*	4300	548	9.8	USEPA (2008)	13
	Xylenes	32	22	*0.5*	470	71.0	67	USEPA (2008)	8
SWS Area	1,2-Dibromoethane (EDB)	20	0	*0.5*	*25*	2.5	--	--	--
	Benzene	20	18	*0.5*	29000	8044	130	USEPA (2008)	15
	Ethylbenzene	20	17	*0.5*	600	235	7.8	USEPA (2008)	15
	Methylene Chloride	20	0	*2*	*100*	8.8	98.1	USEPA (2006)	--
	Naphthalene	20	20	0.3	4500	1683	193	USEPA (2003)	15
	Toluene	20	7	*0.5*	30	3.9	9.8	USEPA (2008)	1
	Xylenes	20	18	*0.5*	770	146.0	67	USEPA (2008)	7

Notes:

Former SSS Area - Former Sodium Styrene Sulfonate Area

SWS Area - Southwest Seep Area

ESV - Ecological Screening Value

1, Shaded constituents were selected for pore water investigation.

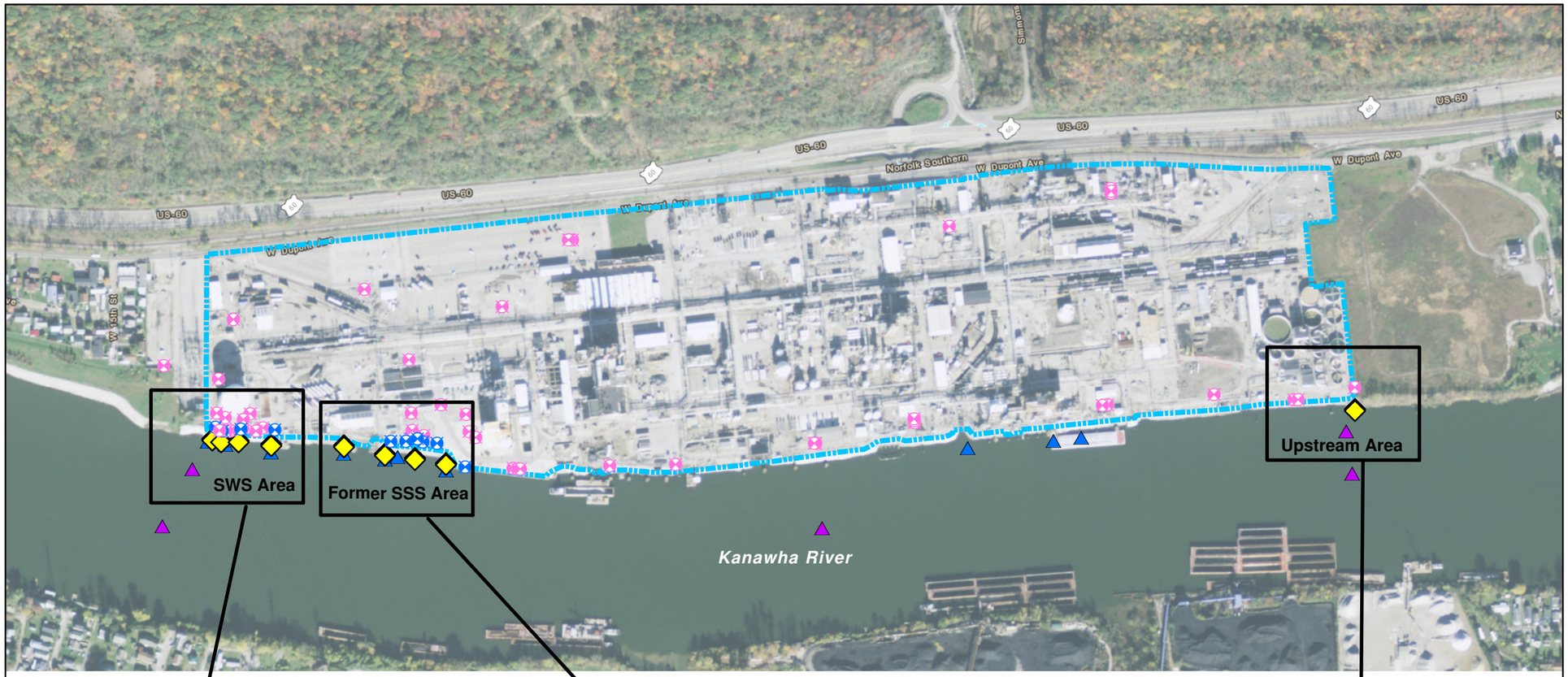
2, Minimum (Min) and maximum (Max) concentrations; Detection limit (DL) shown in italics when the concentrations are below DL.

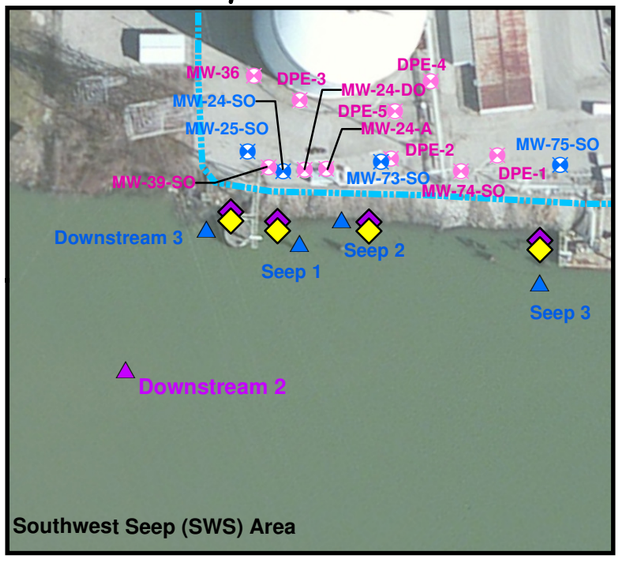
3, Arithmetic mean (Mean) concentrations; Non-detects taken at 50% of the DL for the mean calculations.

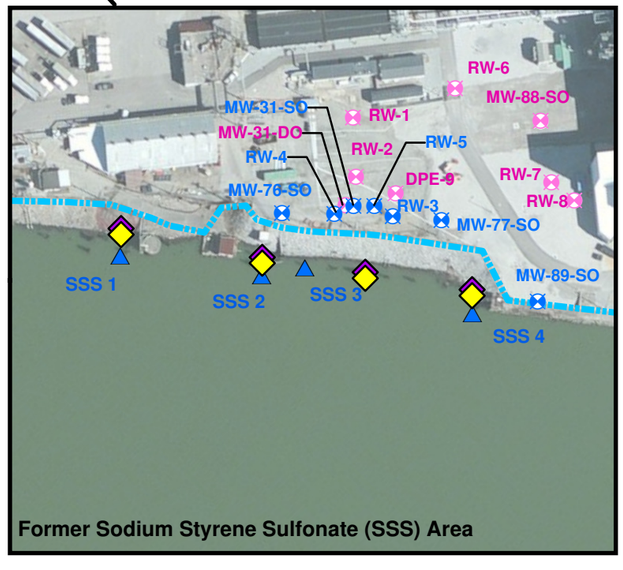
4, Number of samples detected above the corresponding ESV.

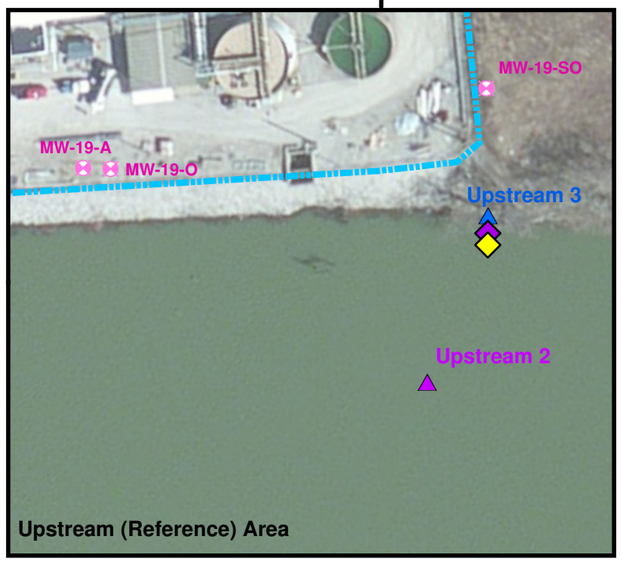
[Data Source: AECOM (2015)]

Figures









Legend

Proposed Pore Water Location

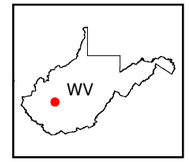
- Near Bank Sample
- Far Bank Sample

Groundwater Well Location

- GW Flux Model
- Other

2003 Surface Water Location

- Near-Surface/Mid-Column Sample
- Near-Surface/Near-Bottom Sample
- Plant Boundary



NAD 1983 State Plane West Virginia South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

Data Sources:
Kanawha River Sampling Locations.dwg

0 250 500 1,000 Feet

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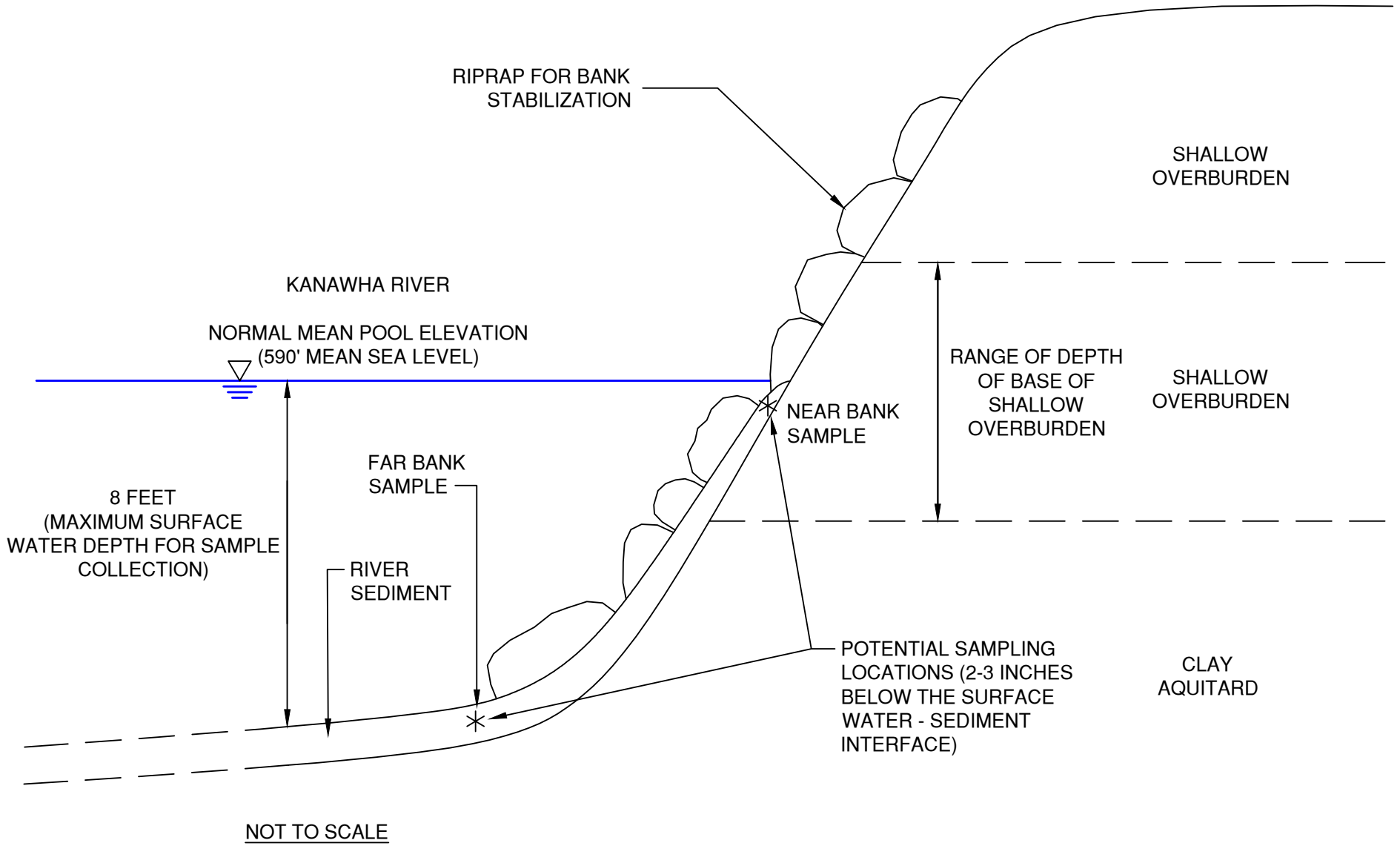
Figure 1
Proposed Pore Water Sampling Locations

2015 Pore Water Work Plan
Chemours Belle Plant
Belle, West Virginia

Prepared By: PJL	Checked By: BR
Job: 60389864	Date: 9/16/2015

Document Path: S:\Projects\IMS\DUPONT\BELLE\Maps\Pore Water Work Plan\Figure 1 Proposed Sampling Locations.mxd



DESIGNED BY: K. DAVIS DRAWN BY: D. LITTEL DATA QUALITY CHKD: D. McCUE APPROVED BY:	AECOM Sabre Building, Suite 300 4051 Ogletown Road Newark, Delaware 19713 Phone: 302-781-5900	RIVERBANK CONDITIONS SCHEMATIC CHEMOURS BELLE PLANT BELLE WEST VIRGINA	PROJECT NO. 60389864 DATE 9/11/15 FIGURE No: 2

Appendix A
Pore Water Sampling and Analysis Plan

Pore Water Sampling and Analysis Plan

The detailed procedures for collecting pore water samples for water quality parameters and for sample analysis are provided below. Sample stations will be accessed using a boat.

Equipment

The following equipment/supplies may be used to collect pore water samples from a boat:

- Boat and motor
- Anchoring devices and line as necessary
- Water depth recording device (weighted tape and/or electronic depth recorder)
- Stainless-steel PushPoint Sampler with guard rod
- MHE Screen-Soks
- Steel sampling platform
- Dedicated 0.45-µm filters
- Syringe, with Luer-Lok type fitting
- Tubing
- Decontamination supplies
- Brushes
- Wash tubs
- Buckets
- Garden sprayers with MHE cleaning adapter
- Alconox detergent (or equivalent)
- Potable tap water
- Organic-free water deionized (DI) or distilled water
- Trash bags
- Plastic sheeting
- Sample bottles and labels provided by the laboratory
- Cooler with ice
- Field logbook/field data sheets
- Pencils and waterproof/permanent marking pens
- Sampling location map
- Water quality meter for in-situ water quality testing
- Global positioning system (GPS)
- Camera
- Cellular telephone
- Chain-of-custody (COC) forms
- Custody seals
- Appropriate health and safety equipment

Instrument Calibration

Electronic equipment used during sampling will include surface-water meters capable of reading water quality parameters, including temperature, specific conductivity (SC), oxidation-reduction potential (ORP),

and pH. The meters will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations. Calibration of field instruments will be performed on a daily basis, and the stability of the calibration will be verified during sampling activities as warranted. Field personnel properly trained in these procedures will perform operation and calibration of the field instruments, and calibration data will be documented in the field logbook and/or data sheet.

Decontamination Procedures

The PushPoint sampler will be decontaminated before sampling begins and between sampling locations. The following steps will be used to decontaminate the PushPoint sampler:

- Be aware of safety procedures. Don appropriate personal protective equipment (PPE).
- Clean the exterior of the guard rod, steel sampling platform, and PushPoint sampler with a stiff brush and Alconox detergent (or equivalent) to remove residual sediment.
- Rinse the exterior with surface water.
- Decontaminate the bore of the PushPoint sampler using Alconox detergent (or equivalent) and the cleaning adapter provided with the sampler.
- Gently insert the guard rod into the PushPoint to its end to dislodge any bridged material.
- Re-rinse the bore, in addition to the guard rod and sampling platform, with Alconox detergent (or equivalent), as described above.
- Completely rinse all components of the sampler with a DI or distilled water rinse.

Following decontamination, the sampling equipment will be placed in a clean area and wrapped in plastic sheeting, heavy-duty trash bags, or provided materials to minimize potential contamination from contact with dust and unclean surfaces.

Sediment Pore Water Collection

A motorized boat will be used to reach the designated sample locations. Caution will be used when conducting sampling from the boat. Health and safety procedures for conducting work over water are detailed in the Health and Safety Plan (HASP) addendum, which will be developed upon EPA approval of this work plan. These procedures will be followed as a required component of the sampling.

The following methods will be used in the collection of *in situ* pore water samples via a PushPoint suction sampler (EPA, 2013; EPA, 2001) from a motorized boat:

- Determine sample locations using a sub-meter accuracy GPS (e.g., Trimble GeoXH6000 GPS unit or GPS equipment with similar accuracy).
- Anchor the boat using two anchors to increase stability and record GPS coordinates of location to be sampled.
- Exercise care to not disturb bottom sediments when positioning the boat at the sampling locations.
- Measure and record water depth using a boat-mounted electronic depth recorder, weighted tape, or marked pole.
- Where applicable (e.g., fine sand), place a dedicated Screen-Sok (MHE Products) over the screened end of the PushPoint sampler and secure the top of the Screen-Sok to the sampler using electrical tape if necessary.
- Insert the guard rod into the bore of the PushPoint sampler.
- Holding the handles of the guard rod and PushPoint sampler together so that guard rod remains fully inserted in the PushPoint sampler, insert the PushPoint sampler into the sediment using a gentle twisting motion until the desired sampling depth is achieved.

- Remove the guard rod from the bore of the PushPoint sampler without disturbing the position of the deployed sampler. Once the guard rod has been removed, do not reinsert it into the device until the bore of the PushPoint has been thoroughly cleansed of all sediment.
- Attach tubing to the PushPoint sample port and syringe.
- Withdraw the piston on the syringe slowly and clamp tubing prior to removing the syringe.
- Remove the syringe and discard the first aliquot of water that is withdrawn from the sampler and then collect a volume sufficient to measure specific conductivity.
- Measure and record the specific conductivity of the sample.
- Fill the syringe.
- Clamp the tubing before removing the syringe to minimize the introduction of air into the tubing.
- Transfer water from syringes into laboratory-supplied bottleware. Where possible, filter samples prior to filling bottleware.
- Place the cap on the laboratory-supplied sampling bottle and place the filled sample on ice.
- Compare specific conductivity values in pore water samples relative to surface water. Measures of specific conductivity in pore water that are comparable to surface-water values can either suggest that overlying surface water may have been drawn into the pore water sample, or that surface water is exchanging with overlying water at a particular sampling location. Professional judgment will be used to decide whether the pore water being sampled is appropriately representative of conditions at the groundwater-surface water interface. Accordingly, appropriate pore water samples will be collected and submitted for analysis.
- Decontaminate sampling equipment between sampling locations as described above.

Field Quality Assurance/Quality Control

Field quality assurance/quality control (QA/QC) samples are designed to help identify and minimize potential sources of sample contamination due to field procedures and to evaluate potential error introduced by sample collection and handling.

Field/Equipment Blanks

It is necessary to collect field blank and equipment blank samples each day that sampling occurs or whenever the equipment is changed to demonstrate that contamination has been controlled.

Duplicate Sample

Due to the limited volume of sample that is able to be collected, duplicate samples will not be collected.

Matrix Spikes and Matrix Spike Duplicates

Separate samples for matrix spikes (MS) and matrix spike duplicates (MSD) are not planned to be collected unless the laboratory requests them because these analyses can be run by most laboratories using an actual sample. The laboratory will provide the arrangement for MS/MSD analyses.

Sample Identification, Handling, and Chain-of-Custody

Samples will be identified, handled, and recorded as described in this sampling guideline. The sample parameters for analysis, preservation, and handling are specified in the Program QAPP. Each sample container has a sample label affixed to the outside. The sampler marks each label with the following information using waterproof ink:

- Project name
- Sample identification number

- Date and time of collection
- Initials of sampling technician
- Requested analysis
- Method of preservation

Sample containers will be packed in bubble wrap to minimize breakage or damage to samples and placed in metal or plastic coolers. Dry ice will be placed around sample containers, and additional cushioning material will be added to the cooler if necessary. Paperwork will be put in a Ziploc bag and placed on top of the sample containers or taped to the inside lid of the cooler. The cooler will be taped closed, and a signed custody seal will be affixed to the side of the cooler. Laboratory address labels will be placed on top of the cooler.

All samples are expected to contain low levels of contamination and will be packaged and shipped as environmental samples in accordance with applicable federal and state regulations. All shipments containing dry ice will conform to federal, state, and carrier regulations. Standard procedures to be followed for shipping environmental samples to the analytical laboratory are outlined below:

- All environmental samples collected will be transported to the laboratory by AECOM personnel, shipped through Federal Express or equivalent overnight service, or picked up by a laboratory courier.
- Shipments will be scheduled to meet holding time requirements.
- The laboratory will be notified to be prepared to receive a shipment of samples. If the number, type, or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

AECOM has established a program of sample COC that will be followed during sample handling activities in both field and laboratory operations. The primary purpose of COC procedures is to document the possession of the samples from collection through shipping, storage, and analysis to data reporting and disposal. The Task Manager or his/her designee will be responsible for monitoring compliance with COC procedures.

Tracing sample possession will be accomplished using the COC record. A COC entry will be recorded for every sample, and a COC record will accompany every sample shipment to the laboratory. At a minimum, the COC record will contain the following information for each sample:

- Sample number and identification of sampling point
- Date and time of collection
- Sample type
- Number, type, and volume of sample container(s)
- Sample preservative
- Analysis requested
- Name, address, and phone number of laboratory or laboratory contact
- Signature, dates, and times of persons in possession
- Any necessary remarks or special instructions

Once the COC is complete and the samples are ready for shipment, the COC will be placed inside the shipping container, and the container will be sealed. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except the shipping courier, is responsible for sample integrity and safekeeping.

Field Logbook and Field Data Sheet

The most important aspect of documentation is thorough, organized, and accurate record keeping. All information pertinent to the investigation will be recorded in the field logbook and/or field data sheets. Entries will include the following, as applicable:

- Project name and number
- Name of sampler and field personnel
- Date and time of sample collection
- Sample number, location, and depth
- Sampling method
- Sampling media
- Sample type
- Sample physical characteristics
- Observations at the sampling site (e.g., weather conditions)
- Summary of daily tasks and information concerning sampling changes, scheduling modifications, and change orders dictated by field conditions

Field investigation situations vary widely. No general rules can include each type of information that must be entered in a logbook or data sheet for a particular site. Site-specific recording will include sufficient information so that the sampling activity can be reconstructed without relying on the memory of field personnel.

Laboratory Quality Assurance/Quality Control

Additional QA/QC procedures after sample collection will be implemented to ensure that collected data are both representative and valid. Data Quality Objectives (DQOs) enable the decision-maker to assess the level of certainty that can be attributed to environmental measurements. The QA program includes the following DQOs: accuracy, precision, completeness, representativeness, and comparability. The following QA/QC samples will be analyzed to document sample integrity and field procedures:

- Trip blanks
- Equipment rinsate blanks
- Matrix spike (MS)/matrix spike duplicates (MSDs)

Laboratory method blanks will also be prepared and analyzed along with the samples to monitor potential contamination coming from the analytical process. In addition, laboratory control samples prepared and analyzed along with the samples to monitor laboratory performance.

Analytical data included in the project report will be reviewed in accordance with the Chemours In-House data review (DVM) process to determine data usability. The DVM process consists of an evaluation of the data based on sample holding times, blank contamination, MS/MSD recoveries, MS/MSD relative percent differences, laboratory control spike/laboratory control spike duplicate (LCS/LCSD) recoveries, LCS/LCSD relative percent differences, and surrogate recoveries. Based on the QA/QC data review, the sampling results presented will help determine usability for the project objectives with some of the following EPA Region 3 data qualifiers:

- B – Not detected substantially above the level reported in the laboratory or field blanks.
- R – Unusable result; analyte may or may not be present in the sample.
- J – Analyte present; reported value may not be accurate or precise.
- UJ – Not detected; reporting limit may not be accurate or precise.

Additional information regarding these qualifiers is contained in the DVM narrative report included with the analytical data.

Consistent with EPA Region 3 guidelines, third-party data validation will be performed on a portion of the groundwater dataset. Because the Chemours DVM review process noted above will be performed on 100% of the data generated for the sampling event, 10% of the pore water dataset will be submitted for third-party validation. Data will be submitted for validation by Environmental Standards, Inc. in Valley Forge, Pennsylvania.

The data validation will included an evaluation of sample holding times; sample condition upon laboratory receipt; laboratory and field blanks; calibration and calibration verification; gas chromatograph/mass spectral (GC/MS) tuning and system performance; internal standard areas; analytical sequence; a critical evaluation of instrumental raw data; retention times; ion abundance ratio (where applicable); qualitative identification and quantitation of results; surrogate and extraction standard recoveries (where applicable); post-analytical spike recoveries, interference check samples and serial dilution results (where applicable); MS/MSD recoveries and precision; LCS/LCSD recoveries and precision; laboratory duplicate precision (where applicable).

Health and Safety Procedures

To avoid incidents or injuries during sampling, the following health and safety procedures should be followed. Complete health and safety information is provided in the HASP addendum:

- Toxic or otherwise harmful concentrations of site-related constituents are unlikely to be encountered while sampling pore water in the Kanawha River. However, sampling crews should be trained in the general hazards of field sampling (e.g., waterborne pathogens) and how to minimize risks of exposure.
- Operating in or around waterbodies carries the inherent risk of drowning. U.S. Coast Guard approved personal flotation devices must be worn when operating or sampling from a boat, when sampling in more than a few feet of water, or when sampling in swift currents.
- Collecting samples in cold weather, especially around cold waterbodies, carries the risk of hypothermia and collecting samples in extremely hot and humid weather carries the risk of dehydration and heat stroke. Sampling team members should wear adequate clothing for protection in cold weather and should carry an adequate supply of water or other liquids for protection against dehydration in hot weather.
- Sampling team members must cover exposed skin and/or use sunscreen for protection from sun exposure.
- When working on all waterbodies, sampling teams must develop and employ an emergency response plan, including the use of a standby motorized rescue boat. The rescue boat will be deployed in the waterbody to maintain a visual on the sampling team at all times. If the sampling team encounters an emergency situation, the rescue team will be prepared to provide immediate assistance, as needed.

References

EPA. 2001. *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual*. EPA 823-B-01-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

EPA. 2013. *Operating Procedure. Pore Water Sampling*. United States Environmental Protection Agency, Region 4, Science and Ecosystem Support Division, Athens, Georgia. February 28, 2013.